

A CONTINUATION METHOD FOR REGULARIZED CONTACT MECHANICS CONSTRAINED OPTIMIZATION

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Abstract

Optimal design with contact constraints comprises an important class of problems. Solutions of these problems determine optimal configurations of engineering systems that ubiquitously contain two or more bodies in contact. However, such problems have mathematical and computational challenges due to the design problem complementarity constraints of the contact gap and pressure. Complementarity constraints are known to violate the linear independence constraint qualification (LICQ) condition, which is the basis for establishing Lagrange multiplier uniqueness and connecting the Karush-Kuhn-Tucker (KKT) conditions with first-order local optimality. In this work, we develop and employ a continuation-based approach for design optimization problems with regularized contact constraints. We borrow ideas from robust and scalable filter-line search interior-point optimization methods. We report numerical results for a number of contact design optimization problems and discuss future directions, in particular the need to enable higher order derivatives of contact through tools such as efficient automatic differentiation.